

01UDSOV - Modeling and control of cyberphysical systems

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Part II, Lab activity n. 2

1. Formulate the problem of identifying the mathematical model of the plant in the set-membership framework, on the basis of the following information:

(a) the plant can be modeled by a discrete-time linear time-invariant system described by the following transfer function

$$G(z) = \frac{\theta_3 z^2 + \theta_4 z + \theta_5}{z^2 + \theta_1 z + \theta_2}$$

- (b) A set of 50 input-output data pair (available in the data file *exp_data*) has been collected to describe the input-output behavior of the plant.
- (c) The input sequence is assumed to be exactly known, while the output data are known to be corrupted by an additive noise $\eta(t)$ having absolute value of amplitude bounded by $\Delta\eta = 5$.
2. Provide a mathematical formulation of the optimization problems to be solved for the computation of the PUIs and the central estimate θ_c .
 3. Provide an accurate description of the data structure to be built in order to solve the problem with the sparsePOP software.
 4. Write a MATLAB script for the computation of the PUIs.
 5. Discuss how to force the dcgain of the identified system to be 118 .

Remark 1: Use the '*active-set*' POP solver.